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ABSTRACT:

PURPOSE: To prove the quality of a cured film in response to various types of semiconductor wafers by providing an ultraviolet ray radiation dosimeter for detecting the quantity of an ultraviolet ray of a mercury lamp near the wafer of a resist curing device for curing a resist coating the wafer.

CONSTITUTION: A radiation intensity command is sent from a calculation controller 3 to a frequency/voltage varying unit 6 according to a process of the type of a semiconductor associated in advance, and the frequency/voltage according to this command is applied to a mercury lamp 2. If the value of an ultraviolet ray radiation dosimeter 9 which detects the illuminance of the lamp 2 becomes different from a reference value, the controller 3 judges the necessity of correction. If it is necessary, a correction command is set to the unit 6, and corrected voltage and frequency are applied to the lamp 2. Accordingly, even if the illuminance of the lamp is reduced due to the irregularity of the lamp and the lapse of a firing time, the ultraviolet ray having the illuminance and the time responsive to the process of the type is always applied onto a semiconductor wafer 1.

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⑭ 発明の名称 レジスト硬化装置

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明 細 書

1. 発明の名称

レジスト硬化装置

2. 特許請求の範囲

半導体ウエハに塗布されたレジストに水銀灯の紫外線を照射して硬化させるレジスト硬化装置において、

前記半導体ウエハの近傍に設けられた紫外線照射量計と、

あらかじめ設定された半導体ウエハのプロセスに従った照射基準が設定され、前記紫外線照射量計の検出量と比較し演算して照射強度を補正する演算制御装置と、

この補正值に基いて前記水銀灯に印加される電圧と周波数を増減する周波数・電圧可変装置とを設けたことを特徴とするレジスト硬化装置。

3. 発明の詳細な説明

〔発明の目的〕

(産業上の利用分野)

本発明はレジスト硬化装置係り、特に半導体ウ

エハに塗布されたレジストの硬化装置に関する。

(従来の技術)

半導体製造工程において、半導体ウエハ上のレジストは熱と紫外線で硬化されるが、必要な照射強度と時間は半導体の種類で違ってくる。

従来の半導体ウエハのレジスト硬化装置の一例を示す第2図において、電源5に接続された安定器4の負荷側の一侧には水銀灯2の一端が接続され、安定器4の負荷側の他の一侧には電磁接触器の主接点7に直列に接続された照度切換用のコンデンサ8Aと同じくコンデンサ8Bが並列に接続され、コンデンサ8A、8Bの負荷側は水銀灯2の他の一端に接続されている。

又、別に設けられた演算制御装置3から電磁接触器の主接点7を開閉する図示しないコイルの励磁回路をON・OFFする図示しない制御回路には、図示しないインターロックが接続されている。

このように構成したレジスト硬化装置において、電磁接触器の主接点7は、演算制御装置3から出た半導体ウエハの種類に応じた照射強度指令で開

閉されるが、水銀灯の初期のばらつきや点灯時間による照度低下で照射量がばらつく。

(発明が解決しようとする課題)

すると、レジストの硬化度がばらつくので、水銀灯の取り換えを早めていたが、水銀灯がむだになる。

そこで本発明の目的は、レジスト硬化膜の品質管理が容易で水銀灯もむだにしないレジスト硬化装置を得ることである。

[発明の構成]

(課題を解決するための手段と作用)

本発明は、半導体ウエハに塗布されたレジストを硬化するレジスト硬化装置のウエハ近傍に、水銀灯の紫外線量を検出する紫外線照射線量計を設け、この検出量をあらかじめ半導体ウエハの種類別のプロセスに従った照射基準が設定された演算制御装置へ送って比較し、その補正値を周波数・電圧可変装置へ伝送して水銀灯へ印加する電圧と周波数を変えることで、水銀灯の点灯時間や水銀灯個々のばらつきで紫外線の照射量が変動しても、

又、製造ロットで半導体ウエハの種類が異なっても、水銀灯をむだにすることなく一定のレジスト硬化膜を得ることのできるレジスト硬化装置である。

(実施例)

以下、本発明のレジスト硬化装置の一実施例を第1図で説明する。

第1図において、電源5に接続された周波数・電圧可変装置の負荷側には安定器4を介して水銀灯2が接続され、半導体ウエハ1の近傍には紫外線照射線量を検出してその値を演算制御装置3へ送る紫外線照射線量計9が設けられている。

このような構成のレジスト硬化装置においては、予め組込まれた半導体の種類別のプロセスに従って演算制御装置3から照射強度指令が周波数・電圧可変装置6に送られ、水銀灯2にはその指令に従った周波数・電圧が印加されるが、もし、水銀灯2の照度を検出した紫外線照射線量計9の値が基準値と異なると演算制御装置3で補正の要否が判断され、必要であれば補正指令が周波数・電圧

可変装置6へ送られて水銀灯2には補正された電圧と周波数が印加される。

したがって、水銀灯のばらつきや点灯時間の経過で照度が落ちてても、半導体ウエハ1上には常にその種類別のプロセスに応じた照度と時間の紫外線を照射することができる。

なお、上記実施例では、水銀灯の紫外線について述べたが、例えば半導体ウエハの予熱や保温のための赤外線等についても適用できる。

[発明の効果]

以上、本発明のレジスト硬化装置によれば、半導体ウエハに塗布されたレジストを水銀灯で硬化するために、半導体ウエハの近傍に水銀灯が出す紫外線の量を検出する紫外線照射線量計を設け、この紫外線照射線量計で検出した紫外線の検出量をあらかじめ被照射体の種類に応じた照射プロセスが設定された演算制御装置へ送って比較し、その補正値を周波数・電圧可変装置へ送って水銀灯の放電電圧と周波数を制御したので、水銀灯の特性のばらつきや経時変化に関係なく、水銀灯をむ

だにすることなく、各種の半導体ウエハに応じて硬化膜の品質を保証することのできるレジスト硬化装置を得ることができる。

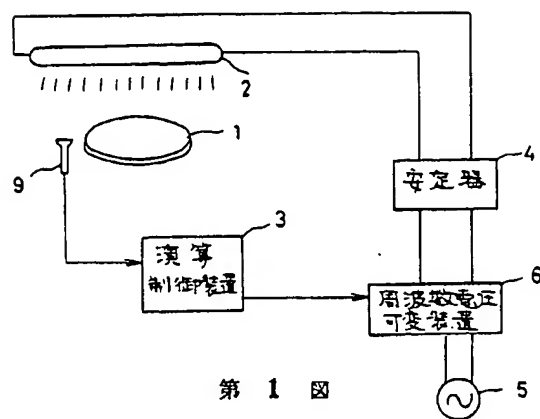
4. 図面の簡単な説明

第1図は本発明のレジスト硬化装置の一実施例を示す図、第2図は従来のレジスト硬化装置の一例を示す図である。

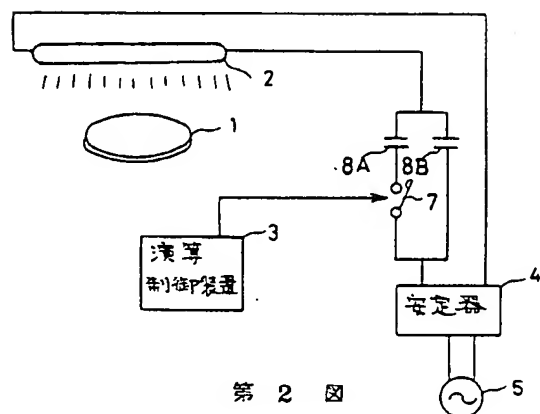
- 1…半導体ウエハ
- 2…水銀灯
- 3…演算制御装置
- 6…周波数・電圧可変装置
- 9…紫外線照射線量計

(8733) 代理人 弁理士 猪 股 祥 晃

(ほか 1名)



第 1 図



第 2 図

PTO 05-334

Japanese Kokai Patent Application No. Hei
2[1990]-20015

APPARATUS FOR CURING RESIST

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APPARATUS FOR CURING RESIST

[Rejisuto koka sochi]

Inventor:	Akinori Tanigawa
Applicant:	Toshiba Corporation

[There are no amendments to this patent.]

Claim

An apparatus for curing a resist, characterized by the fact that in an apparatus for curing a resist that cures a resist that is spread on a semiconductor by irradiating ultraviolet rays from a mercury lamp, it is equipped with an ultraviolet ray dosimeter installed in the vicinity of the above-mentioned semiconductor wafer, a calculation controller that sets a radiation amount reference in accordance with a preset process of the semiconductor wafer, compares it with the amount of said ultraviolet ray dosimeter being detected, calculates it, and corrects the irradiation intensity, and a frequency/voltage varying unit that increases and decreases a voltage and a frequency being applied to the above-mentioned mercury lamp based on the corrected value.

Detailed explanation of the invention

Purpose of the invention

Industrial application field

The present invention pertains to an apparatus for curing a resist. In particular, the present invention pertains to an apparatus for curing a resist spread on a semiconductor wafer.

Prior art

In the manufacturing processes of a semiconductor, a resist on a semiconductor wafer is cured with ultraviolet rays, however the required irradiation intensity and time depend on the kind of semiconductor.

In Figure 2 showing an example of a conventional apparatus for curing a resist of a semiconductor wafer, one end of a mercury lamp 2 is connected to the load side of a stabilizer 4 connected to a power source 5, capacitors 8A and 8B for switching the illuminance connected in series to a main contact 7 of an electromagnetic contact unit are connected in parallel to the other side of the load side than the stabilizer 4, and the load side of the capacitors 8A and 8B is connected to the other end of mercury lamp 2.

Also, an interlock, which is not shown in the figure, is connected to a control circuit that is not shown in the figure and turns an excitation circuit of a coil, which is not shown in the figure, on and off for opening and closing the main contact 7 of the electromagnetic contact unit from a separately installed calculation controller 3.

In the apparatus for curing a resist with this constitution, the main contact 7 of the electromagnetic contact unit is opened by an irradiation intensity instruction in accordance with the kind of semiconductor wafer output from the calculation controller 3, however the amount being irradiated is scattered by the initial scattering of the mercury lamp or the illuminance decrease due to the lighting time.

Problems to be solved by the invention

Thus, since the degree of curing of the resist is scattered, the mercury lamp has to be replaced early, leading to mercury lamps being wasted.

Accordingly, the purpose of the present invention is to obtain an apparatus for curing a resistor that easily control the qualities of a resist cured film and does not waste a mercury lamp.

Constitution of the invention

Means to solve the problems and operation

According to the apparatus for curing a resist of the present invention, an ultraviolet ray dosimeter for detecting the ultraviolet dose of a mercury lamp is installed in the vicinity of a wafer of the apparatus for curing a resist that cures a resist spread on a semiconductor wafer, and the amount detected is sent to a calculation controller in which an irradiation reference is preset in accordance with the processes for each kind of semiconductor wafer and compared with it. The corrected value is transferred to a frequency/voltage varying unit, and a voltage and a frequency being applied to the mercury lamp are changed. Thus, even if the amount of ultraviolet rays being irradiated is changed by each scattering of the mercury lamp and the lighting time of the mercury lamp and even if the kind of semiconductor wafer depends on manufacture lots, a fixed resist cured film can be obtained without wastage to the mercury lamp.

Application example

Next, an application example of the apparatus for curing a resist of the present invention is explained using Figure 1.

In Figure 1, a mercury lamp 2 is connected via a stabilizer 4 to the load side of a frequency/voltage varying unit connected to a power source 5, and an ultraviolet ray dosimeter 9 that detects an ultraviolet irradiation dose and sends the value to a calculation controller 3 is installed in the vicinity of a semiconductor wafer 1.

In the apparatus for curing a resist with this constitution, an irradiation intensity instruction is sent to the frequency/voltage varying unit 6 from the calculation controller 3 in accordance with the processes for each kind of semiconductor assembled in advance, and the frequency and the voltage according to the instruction are applied to the mercury lamp 2. If the value of the ultraviolet ray dosimeter 9, which detects the illuminance of the mercury lamp 2, is different from a reference value, whether or not a correction is required is decided by the calculation controller 3. The lighting time of the mercury lamp and if a correction is required, a correction instruction is sent to the frequency/voltage varying unit, and corrected voltage and frequency are applied to the mercury lamp 2.

Therefore, even if the illuminance is dropped by scattering of the mercury lamp or the lapse of lighting time, ultraviolet rays with the illuminance and the time in accordance with the processes for each kind of semiconductor wafer can always be irradiated onto the semiconductor wafer 1.

Also, in the above-mentioned application example, the ultraviolet rays of the mercury lamp have been mentioned, however for example, infrared rays for preheating and warming a semiconductor wafer can also be applied.

Effect of the invention

Next, according to the apparatus for curing a resist of the present invention, in order to cure a resist that is spread on a semiconductor wafer using a mercury lamp, an ultraviolet ray dosimeter for detecting the amount of ultraviolet rays being emitted from the mercury lamp is installed in the vicinity of the semiconductor wafer, and the amount of ultraviolet rays detected by the ultraviolet ray dosimeter is sent to a calculation controller in which the irradiation processes for each kind of object being irradiated are preset and compared with it, and the corrected value is sent to a frequency/voltage varying unit, so that the discharge voltage and the frequency of the mercury lamp are controlled. Thus, an apparatus for curing a resist that can guarantee the qualities of a cured film in accordance with various kinds of semiconductor wafers without wastage of the mercury lamp, regardless of the scattering characteristic of the mercury lamp and the changes in lighting times, can be obtained.

Brief description of the figures

Figure 1 shows an application example of the apparatus for curing a resist of the present invention. Figure 2 shows an example of a conventional apparatus for curing a resist.

- 1 Semiconductor wafer
- 2 Mercury lamp
- 3 Calculation controller

- 6 Frequency/voltage varying unit
- 9 Ultraviolet ray dosimeter

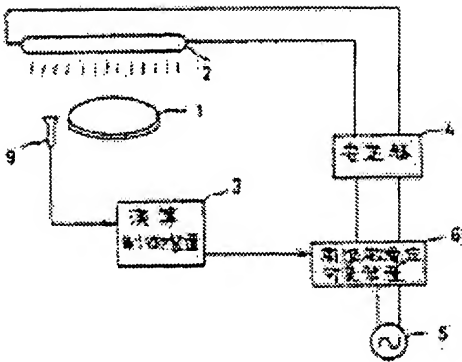


Figure 1

- Key:
- 3 Calculation controller
 - 4 Stabilizer
 - 6 Frequency/voltage varying unit

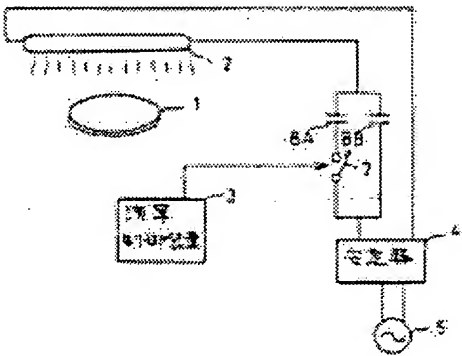


Figure 2

- Key:
- 3 Calculation controller
 - 4 Stabilizer